

**DRAFT**

US LHC Accelerator Research Program  
Task Sheet

**Task Name:** Tune Feedback

**Date:** 4 June 04

**Responsible Person:** Peter Cameron

**Budget:** BNL \$200K

**Statement of work for FY05** (include description of year's "deliverable" and, if appropriate one or a few intermediate milestones):

**BNL deliverables:**

1. evaluation of data emerging from PLL studies at CERN SPS during FY04, including data from 245MHz system, as well as resonant and diode detection baseband studies.
2. Data from 245 MHz PLL and TF efforts at BNL during RHIC 2005 (loop bandwidths, operationally useful PID parameters, magnet control filter parameters, coupling measurement during ramping, chromaticity measurement during ramping, emittance growth as a function of kicker excitation, utilization in beam experiments on beam-beam, electron cloud,,...)
3. Coupling studies, including use of PLL coupling measurement methods for correction of tune data provided to magnet control, as well as for coupling correction
4. Installation in RHIC and operation of pickups and motion control (as required) for baseband PLL development
5. Design, fabrication, testing, and operation of electronics and software for baseband PLL development
6. Specific studies as needed in the areas of multi-carrier PLL, synchrotron satellites, damper noise floor, dynamic range, emittance growth, coupling, autoexcitation, chromaticity,...
7. travel to CERN to support collaboration effort, 2 people for 2 trips, 1 week each trip.

**BNL Personnel and tasks:**

Peter Cameron (overall responsibility), Al DellaPenna (hardware, operations), Joe Mead (DSP code), Chris Degen (LabVIEW), Marty Kesselman (mathcad modeling), Carl Schultheiss (magnet control, mathcad and Matlab modeling, beam simulation), and Yun Luo (coupling studies).

**CERN liason:**

Rhodri Jones, Hermann Schmickler, Marek Gasior

**Statement of expected follow-on work in subsequent years** (include "ultimate" goal and time scale for this sub-program, as well as plans for specific work and rough budget need for next 2 years):

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**BNL follow-on work:**

1. beam experiments at RHIC with RHIC PLL/TF systems modified as appropriate to gain information beneficial to LHC TF.
2. participation in design of LHC pickups, specification of motion control,...
3. design and delivery of AFE and digitizer boards for LHC tune feedback
4. DSP code for LHC tune feedback
5. LabVIEW code for LHC tune feedback
6. Mathcad modeling of LHC PLL/TF system
7. Matlab/UAL modeling of LHC PLL/TF system
8. travel to CERN to support the above efforts

**Ultimate goal of these efforts: Tune feedback in LHC, time scale to extend 2 years beyond initial beam in LHC.**

**BNL FY06 TF budget: 1.25 FTE plus \$100K materials/travel**

**BNL FY07 TF budget: 1.5 FTE plus \$150K materials/travel**